DOCUMENT RESUME

ED 394 755 RC 020 554

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TITLE Preparing School Systems To Deliver a Hybrid Education Program for Students with Autism Via Distance Learning Classrooms, In-Class Teleconferencing, and Listserv Technology.
PUB DATE Mar 96
NOTE 18p.; In: Rural Goals 2000: Building Programs That Work; see RC 020 545.
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Autism; Behavior Disorders; *Behavior Modification; Classroom Communication; Classroom Techniques; *Distance Education; *Educational Technology; Elementary Secondary Education; Higher Education; Inclusive Schools; *Inservice Teacher Education; Models; Program Descriptions; Student Development; Teacher Student Relationship; *Teaching Methods; Technical Assistance
IDENTIFIERS Johns Hopkins University MD; *Maryland

ABSTRACT

The Center for Technology in Education (CTE), a partnership between Johns Hopkins University and the Maryland state department of education, developed a model for teaching autistic students that integrates technology-based instructional and behavioral supports into existing curriculum. The goal is to promote student gains in communication, social skills, and academics, as well as to increase students' overall involvement in classroom activities. The model recommends teacher training in providing clear instructions, prompts and prompt fading, positive reinforcement, behavior modification techniques, and advanced teaching principles such as targeting student responsiveness and providing students with opportunities for appropriately communicating their needs. The model also advocates the use of light or high technology based on student needs and demands of the learning task. Light and high technology include equipment such as voice output communication devices, picture systems, sequence and cue cards, touch screens, modified keyboards, switch access devices, and sign language. Teachers also need to target behaviors related to motivation, cooperation, and responsiveness; learning strategies and methods that help students learn more efficiently; and skills that help all students function in the inclusive educational setting. Equally important is the development of an individualized continuity plan that promotes longitudinal gains and transitions across teams of staff members within a school or across schools, and the use of school-wide staff training to promote methods of inclusion. Currently, CTE is exploring alternative methods for disseminating technical assistance and teacher training to local education agencies throughout Maryland using distance learning classrooms, in-class teleconferencing, and listserv technology. (LP)

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ED 394 755

PREPARING SCHOOL SYSTEMS TO DELIVER A HYBRID EDUCATION PROGRAM FOR STUDENTS WITH AUTISM VIA DISTANCE LEARNING CLASSROOMS, IN-CLASS TELECONFERENCING, AND LISTSERV TECHNOLOGY

One of the most difficult challenges teachers and local educational agencies face today is educating students with pervasive developmental disorders such as autism. Teachers frequently describe these children as unique, puzzling, mysterious, and difficult to teach. They often comment that their students with autism rarely interact, communicate, or appear motivated to participate in academic or social activities. A committed teacher provided the following comment before receiving training: "He came into my room the first day and cried and showed absolutely no interest in anything, I was at a loss." Given the widespread behavioral deficits characteristic of autism and the limited resources available, teachers repeatedly face an enormous task as they strive to help these children learn. Aside from posing a challenge to teachers, LEAs are recurrently in a quandary as they form policy and develop curricula. Unfortunately, LEAs typically commit their resources to a single approach, then quickly discover that one approach does not easily serve all of their students with autism.

The Center for Technology in Education (CTE), a partnership of Johns Hopkins University and the Maryland State Department of Education, is developing a hybrid paradigm in which technology-based instructional and behavioral supports are infused into existing curricular activities to help promote gains in communication, social skills, and academics, as well as to increase the children's overall involvement in classroom activities. In addition, CTE is exploring alternative methods for disseminating technical assistance to LEAs throughout the state of Maryland using Distance Learning Classrooms, In-Class Teleconferencing, and LISTSERV Technology.

Technology-Based Hybrid Educational Model for Children With Autism

This hybrid paradigm is based on interdisciplinary research and years of educational experience and has four central components:

* Effective Behavioral Teaching Principles
* Curriculum-Wide Integration of Technology
* Flexible and Longitudinal Curriculum Guide
* Systemic Change Activities

RC 020554

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Effective Behavioral Teaching Principles

A set of fundamental teaching principles, based on 30 years of research, now exists and forms the basis for many more advanced teaching strategies. The use of these principles is a central part of the approach. While many professionals are familiar with these principles, it is advantageous to delineate them clearly and to stress their importance in working with students with pervasive developmental disorders such as autism. All educational staff members should be trained in the use of these principles. It is equally vital that significant others, such as parents, learn to use these principles in less structured settings. A brief overview of these fundamental teaching principles is presented below.

1. Effective instructions/requests. For all children, but especially for students with autism, instructions should be brief and clear, should be phrased in the form of a request, should be presented when you have the child's attention or should be used to get the child to attend to you, and should be individualized for each child.

2. Prompts and prompt fading. Prompts can help the child to respond and learn new skills. They can be used to help guide the child to respond. In using prompts, it is important to use the least intrusive, yet effective, prompt. Prompts can be verbal, gestural, and physical. When physical prompts are used, it is advantageous not to overuse "hand-over-hand" or other full physical "holding" prompts. While effective, these are very difficult to fade.

3. Consequences. Consequences, in the form of positive reinforcement, should involve presenting highly preferred items or other events contingent on the display of the appropriate target behavior. It is vital that the items be things that the child clearly wants and finds reinforcing. In general, consequences should come soon after the child exhibits the target behavior. In addition, delivering positive consequences following a sequence of both disruptive and cooperative behaviors might inadvertently produce an increase in the disruptive behaviors. If a child first shows disruptive behaviors, then displays appropriate behaviors and is subsequently reinforced, he may learn that he needs to exhibit both to get reinforcement. It is usually advisable not to reinforce these chains of behaviors.

In recent years, increased emphasis has been placed on integrating natural/direct reinforcers throughout a child's day. Natural/direct reinforcers are consequences that are directly related to the activity. For instance, if a child uses a picture exchange system to communicate that the child wants a break, giving the child a break would be a natural reinforcer. Placing emphasis on using natural/direct reinforcers, rather than relying only on artificial reinforcers often leads to increased performance and cooperation.

4. Chaining. Chaining involves breaking down a complex task into steps, establishing criteria for success for each step, and teaching the child to perform each step satisfactorily before adding the next step.

5. Shaping. Shaping involves reinforcing closer approximations of the target response. For instance, if an essentially nonverbal child says "C" for Cup, the teacher would reinforce the child. If the child subsequently says "Cu" he would be reinforced. If he then said "C", no reinforcement would be provided. Only better approximations are reinforced.

In addition to the fundamental teaching procedures described above, during the course of a training project, training would be extended to cover more advanced principles of effective teaching. Depending on the needs of the educational staff, these advanced procedures could include the following:

1. Use of the principle of partial participation. The principle of partial participation involves the idea of setting the occasion for the student to partially participate in an activity or task and arranging for the student to succeed. Over time, the student will learn more and more and will eventually learn to perform the entire task in a more independent manner. Using this principle throughout a child's day helps to ensure low levels of disruptive behavior. In a consistent manner, it is often beneficial to reinforce approximations and attempts. This concept centers on the view that a child who is truly trying to correctly respond should be provided with positive feedback relative to the response. This principle could be used during academic and leisure time periods.

2. Targeting cooperation and responsiveness. Cooperation forms the basis of effective teaching interactions between teachers and students. Cooperation is often increased as students are taught new academic and social skills. It is often advantageous, however, to directly target cooperation and responsiveness in a systematic, yet natural, manner throughout a child's day across settings and activities, and with people. Many children are more focused, responsive, and cooperative when relatively greater emphasis is placed on:

* Presenting the child a relatively short and simple request or instruction.
* Ensuring that the child is oriented to the adult when the instruction is presented.
* Using an appropriate prompting strategy to help the child respond.
* Providing the child with highly preferred items as reinforcers following his display of the targeted response.

The use of this systematic sequence of events is often associated with structured interactions and settings such as one-to-one teaching situations. This sequence also can be integrated, however, throughout a student's day in less structured situations such as small group activities as well as in unstructured situations such as group play. Based on recent research in autism, it is highly preferred to use the sequence of events outlined above on a frequent basis and in a natural manner.

3. Increase the "naturalness" of structured teaching sessions. As children learn to work in structured teaching sessions, it is beneficial to begin to slowly alter these teaching sessions in a

manner that increases their naturalness. Based on previous research and experiences with other children, it is clear that increasing the naturalness may help promote greater generalization. One method for increasing naturalness would involve using materials that are in other less structured, more inclusive educational and social settings.

4. Setting opportunities to have children interact with/control their environment using appropriate communication. Many children with autism attempt to exert control over their environments by using disruptive behavior. From a behavioral perspective, students might exhibit disruptive behavior for one of several reasons: to exert control, to escape demands or other nonpreferred activities; to obtain something; or to communicate. As educational staff work to increase a child's functional communication skills, special emphasis needs to be placed on providing the child with *scheduled opportunities* to appropriately communicate "wants" and "needs." The more a child learns to use an appropriate method to control the environment, the less likely it is that the child will try to use disruptive behaviors.

To ensure that the correct targeted (communication) response has been delineated, educational staff should periodically collect "A-B-C" data.

* "B" refers to the behavior of concern.
* "A" stands for those events that occurred before or "antecedent" to the disruptive behavior.
* "C" denotes what occurred following the disruptive behavior ("consequences").

The results of the A-B-C data analysis can be used to refine the functional communication training program.

5. Use of procedural facilitation/self-monitoring. Self-monitoring programs can help improve a student's behavior as well as teach the student to become more responsible and to work more independently. The major components of a self-monitoring program include defining the behavior, providing initial instruction, teaching the student to self-monitor, having the student practice, delineating and having a backup reinforcer, and fading the program. A self-monitoring program might help increase a child's self-direction and planning skills as well as serve as a "behavioral and information bridge" across inclusion settings.

6. Target skills important for students in inclusive educational settings. Based on observations of students in inclusive educational settings, there appear to be certain skills, other than academic, which are important for success. For instance, as young students get older, they need to learn to work for longer periods of time without the direct supervision of an adult. It is also necessary for young students to learn an appropriate means by which to indicate that they need assistance. Many teachers will directly teach the students to raise their hands or some other method of appropriately getting the attention of the educational staff.

Curriculum-wide Integration Of Technology

This approach involves using light or high technology to help facilitate educational, social, and communication gains and to promote the children's involvement. Rather than prescribing an ideal piece of technology that might travel with the child across all activities and situations, this paradigm emphasizes that different activities may require different light or high technology, such as voice output communication devices, picture systems, sequence and cue cards, touch screen, modified key-boards, switch access devices, or even sign language. In defining the technology for a given situation, the educational team must know the individual child's needs and strengths, specify the environmental and task demands in the particular situation, and delineate the goals for the child. Examples of different technologies are presented in the Table 1, below.

Table 1: Examples of Light and High Technologies

Voice Output Communication Devices
Picture Systems
Sequence and Cue Cards
Touch Screen
Modified Keyboards
Switch Access Devices
Sign Language

The use of these technologies can help teachers "level the playing field" to promote inclusion for children with autism while directly promoting learning and the development of social gains. Emphasis is on the need to integrate "light" and "high" throughout a child's day to help promote communication, social interactions, involvement, and academic gains. Examples of applying technologies to different activities are presented in Table 2.

Table 2: Examples of Implementing Curriculum-Wide Integration of Technology

Example 1: Increasing Involvement During Circle Time

GOAL: To increase involvement during circle time.

Environmental demands:
Students participate in actions and sing along with the teacher.

Individual child needs and strengths:
Non-verbal, cues into visual prompts.

Possible technology:
A number line printed on cardboard, signing.

Example 2: Facilitating Transitions

GOAL: To facilitate transitions in activities during the day.

Environmental demands:
Activities are changed frequently throughout the day.

Individual child needs and strengths:
Child needs concreteness; very visual.

Possible technology:
Picture sequence system.

Flexible and Longitudinal Curriculum Guide

LEA and educational staff must have an overall curriculum guide that allows for both individual specificity as well as the inclusion of children with autism into large group activities. In delineating target behaviors and skills, emphasis must be placed on promoting not only acquisition, but also generalization. Aside from targeting individual behaviors, teachers need to shift to targeting: (a) pivotal behaviors which influence a wide array of other areas of development such as motivation, cooperation, and responsiveness; (b) learning strategies and methods that help students learn more efficiently or in a more robust manner, such as learning through observation, and responding to complex, multicomponent instructions; and (c) inclusion skills that are behaviors, skills, or knowledge that help all students function in the inclusive educational setting, such as raising a hand to get a teacher's attention, sitting for increased periods of time, and knowing and following general classroom cues.

Promoting Systemic Change

Educating students with autism is a serious challenge for even well-trained teachers; successfully working toward inclusion in regular educational settings is often considered an insurmountable obstacle that frustrates teachers, LEA administrators, and parents alike. It is vital, therefore, that staff training is coupled with systemic supports developed and implemented as part of a longitudinal plan.

The use of an individualized continuity plan. To help promote longitudinal gains and transitions across teams of staff members, either within a school or across schools, staff need to receive training to develop and implement an Individualized Continuity Plan. An Individualized Continuity Plan should:

(a) Identify important classroom behaviors which are socially significant for promoting success, such as methods of obtaining attention and assistance from instructional staff

(b) Delineate factors associated with facilitating the acquisition and generalization of educational gains for the targeted child (e g , schedule of reinforcement, use of procedural facilitation/self-monitoring procedures)

(c) Conduct functional analyses of disruptive and key appropriate behaviors such as the use of "A-B-C" data collection

(d) Communicate procedures and principles across settings (e g , home and school, sending and receiving schools) to reduce the likelihood of behavioral contrast

(e) Specify individual child-based factors which may influence success

The use of schoolwide staff training and collaborative teaming activities with a special emphasis on methods of promoting inclusion. This component of the model is based on research pertaining to school restructuring on research on methods of promoting successful inclusion by preparing the receiving school, teachers, and peers by implementing cooperative classwide peer tutoring and a wide variety of positive reinforcement based classroom management techniques. CTE facilitates a series of meetings to obtain additional information from selected schoolwide representatives in order to assist in facilitating collaborative teaming activities. During these meetings, CTE employs electronic meeting software to gather information and build consensus.

Application of Distance Learning Classrooms, In-Class Teleconferencing, and LISTSERV Technology

One of the challenges teachers face today is keeping abreast of the multitude of advances in strategies in working with students with disabilities. Even though there has been a surge of development of effective educational strategies for students with disabilities, logistical difficulties often preclude the delivery of this necessary inservice training for teachers. Individuals who have the expertise often must travel long distances to observe students and provide feedback to teachers as they interact with their students. Furthermore, schools have often expressed that they are unable to relieve the teachers so that they may attend central meetings to discuss follow-up issues.

To solve these problems, CTE is beginning to explore technology-based methods for delivering training, consultation, and follow-up supervision as well as for facilitating discussion and answering questions posed by teachers and parents. As with the use of technology with students, however, technology-based methods of delivering training must be systematically explored to determine how these methods can complement more traditional strategies of providing training.

Distance learning technology. CTE has begun to provide training to LEA staff members in other areas via distance learning classrooms. Beginning in September 1996, CTE/JHU will be offering a specialized track in our Masters in Technology Program in Special Education which will focus on autism. To meet the demand across the state of Maryland, CTE plans to offer some

of these courses via distance learning classrooms. This technology will be used in conjunction with a closed "autism/technology listserv" in order to stimulate more ongoing discussions between students and with the instructors. In addition, it is anticipated that some of the participating teachers also will have in-class teleconferencing stations, as described below.

In-class teleconference technology. In addition to using traditional distance learning classroom technology, CTE is exploring the feasibility of providing follow-up training via "In-class Teleconference" technology as part of a pilot technical assistance project. In this project, CTE is determining how the use of this technology could complement other modes of training, such as workshops, seminars, and on-site consultations. Current technology plays an important role in teacher training and in building cadres of school-based experts to serve children with autism and other developmental disabilities. Given the enormous demand that we and others face, it is vital that we develop more efficacious methods by which off-site "experts" can provide valuable feedback to teachers as they work with their students.

Initially, our efforts is helping us to develop a protocol for placing and using an audio/visual communication station in classrooms. As part of our training plan, these stations will complement our on-site technical assistance visits by allowing teachers and supervisors to immediately discuss follow-up concerns. Based on information obtained from teachers and administrators, this application of technology may assist them substantially in their efforts. Aside from using the technology to "observe and provide feedback," the protocol calls for CTE staff and LEA teachers to review and discuss documents. The effectiveness of the In-Class Teleconferencing Technology is currently being evaluated with all participants.

Listserv Technology. CTE is currently establishing and monitoring a listserv mechanism for participants who work in the area of autism in order to facilitate greater communication and their training. A listserv provides teachers (and parents) opportunities to pose questions, participate in on-going discussions, and share ideas. To gain access to the listserv, education staff and parents must have access to a computer and either a direct network link or a modem to dial in to the listserv.

Preparing School Systems To Deliver a Hybrid Education Program for Students with Autism

Via Distance Learning Classrooms, In-Class Teleconferencing, and Listserv Technology

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I. Background and Significance

A. Challenge of Educating Students with Autism

* Behavioral Needs
* Academic and Social Skills
* Learning Characteristics

B. Challenge of Forming LEA Policy and Curricula

* What should these children be taught?
* How should these children be taught?
* Who should teach these children?
* Where should these children be taught?

C. Challenge of Providing Inservice Training/ Consultation and Supervision

* Low-incidence population
* Logistics - distance, time, financial support
* Efficient method to address questions

II. Technology Based Hybrid Educational Model for Children with Autism

A. Fundamental Behavioral Teaching Principles

B. Curriculum-Wide Integration of Technology

C. Flexible and Longitudinal Curriculum Guide

D. Systemic Change Activities

A. Fundamental Behavioral Teaching Principles

* **Effective instructions/requests**
* **Prompts and prompt fading**
* **Consequences**
* **Chaining**
* **Shaping**

Additional Effective Principles of Teaching

* **Partial Participation**
* **Targeting cooperation and responsiveness**
* **Increase the "Naturalness" of structured teaching sessions**
* **Setting opportunities to have children interact and control their environment using appropriate communication**
* **Target skills important for students in inclusive educational settings**

B. Curriculum-Wide Integration of Technology

* **Using *Light or High Technology* to help facilitate educational, social, and communication gains and to promote the children's involvement.**

* ***Such as*:**
  Voice Output Communication Devices
  Picture Systems
  Sequence and Cue Cards
  Touch Screens
  Modified Key-Boards
  Switch Access Devices
  Sign Language

* **"To level the playing field" *and***
  "To promote Learning"

* **Multiple-Technologies**
  Based on:
  Individual Needs and Strengths
  Environmental Demands
  Projected goals

C. Flexible and Longitudinal Curriculum Guide

* **Overall curriculum guide that allows for both individual specificity as well as the inclusion of children with autism into large group activities**

* **Emphasis must be on promoting acquisition and generalization**

* **Aside from targeting individual behaviors, teachers need to shift to target:**

  (a) pivotal behaviors
  (b) learning strategies
  (c) inclusion skills

D. Systemic Change Activities

* ***An Individualized Continuity Plan*** **to help promote longitudinal gains and transitions across teams of staff members either within a school or across schools**

* ***The Use of School-wide Staff Training and Collaborative Electronic Teaming Activities*** **with a special emphasis on methods of promoting inclusion**

III. Application of Distance Learning Classrooms, LISTSERVs, and In-Class Teleconferencing Technology

A. Distance Learning Classrooms

* Offer courses through a specialized track in our Masters in Technology Program in Special Education

* Provide inservice training on specialty topics

B. Autism/technology listserv

* To stimulate more ongoing discussions between students and with the instructors

* To provides teachers (and parents) opportunities to pose questions, participate in ongoing discussions, and share ideas

* To create a "supportive teaming environment"

C. In-Class Teleconferencing/Review Stations

* **For off-site "experts" to provide valuable feedback to teachers as they work with their children**

* **To Review data and programs**

General Approaches

* **Internet -** ***such as***

  "CU-SeeMe"-Cornell University
  Videoconferencing program
  Macintosh or Windows
  Two-way / multiple stations

  "Connectix Quickcam" or
  "Videolabs Flexcam" or...

  Telephone/ISDN lines -
  Commercial Videoconferencing

  Other